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Hetherington

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[54] **TERMINAL AND DOOR LATCH FOR BATTERY OPERATED DEVICES**

5,373,133 12/1994 Brockway et al. 200/335
5,442,337 8/1995 Hwang 340/635

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[57] **ABSTRACT**

Related U.S. Application Data

A battery terminal and door latch for battery operated devices. The battery terminal and door latch assembly prevents the closure of a battery compartment door when one or more batteries are missing from the battery operated device. In the embodiment, the terminal includes an aperture for engaging a latch on the compartment door. When a battery is installed the terminal is biased so that the aperture engages the latch to close the door. Without an installed battery, the terminal is displaced to prevent the aperture from engaging the latch. The open battery compartment door provides a readily discernible indication that batteries have not been installed. The terminal and door latch assembly is suitable for use with smoke detectors, carbon monoxide detectors and the like.

[62] Division of application No. 08/688,140, Jul. 29, 1996, Pat. No. 5,820,406.

[51] **Int. Cl.⁷** **H01R 3/00**

[52] **U.S. Cl.** **439/500; 429/98; 340/628; 340/693.7**

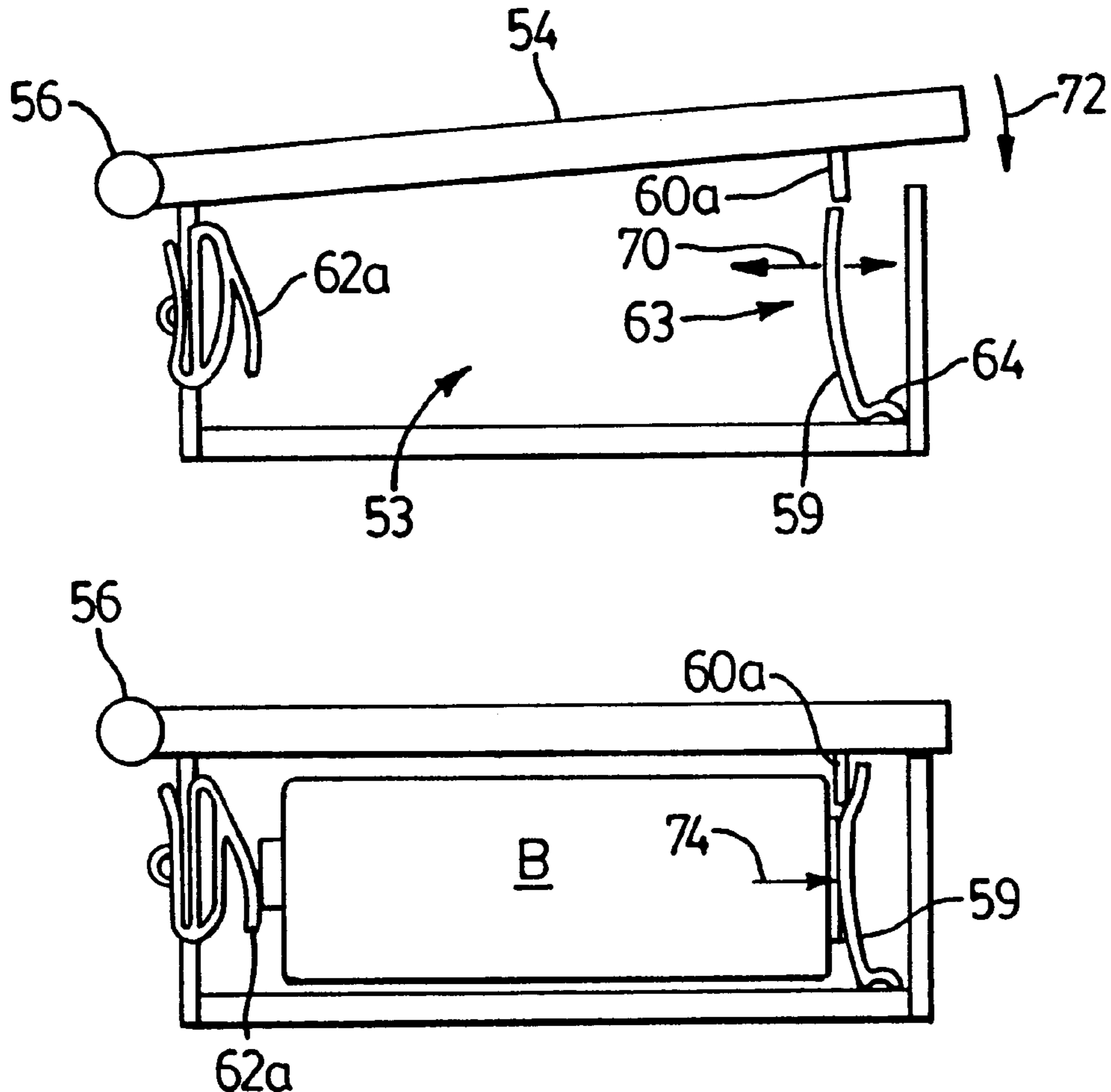
[58] **Field of Search** 439/500, 911; 429/97, 98, 99, 100; 340/691.4, 693.7, 628, 632, 636

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,849,743 7/1989 Ohno 340/687

2 Claims, 5 Drawing Sheets



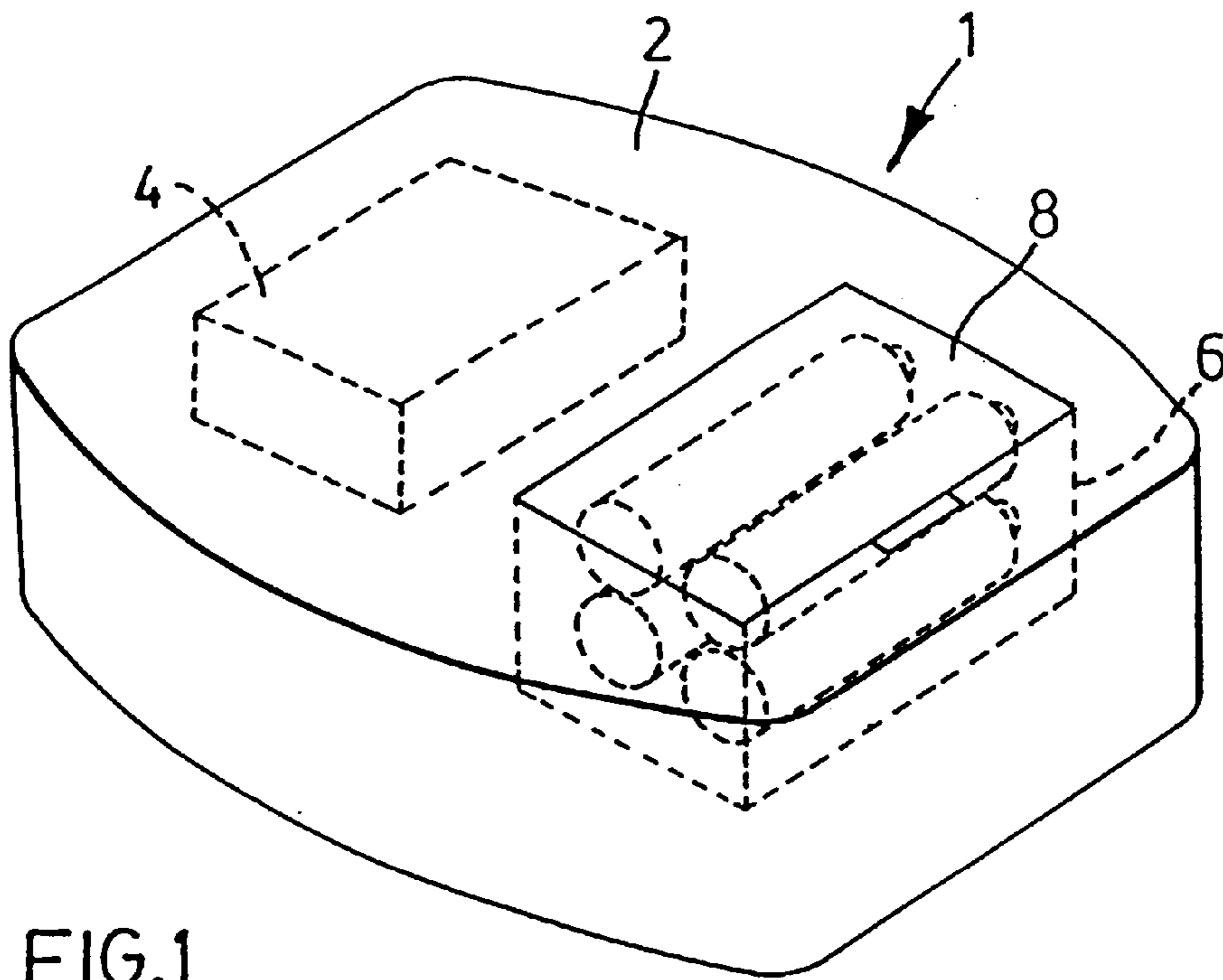


FIG. 1

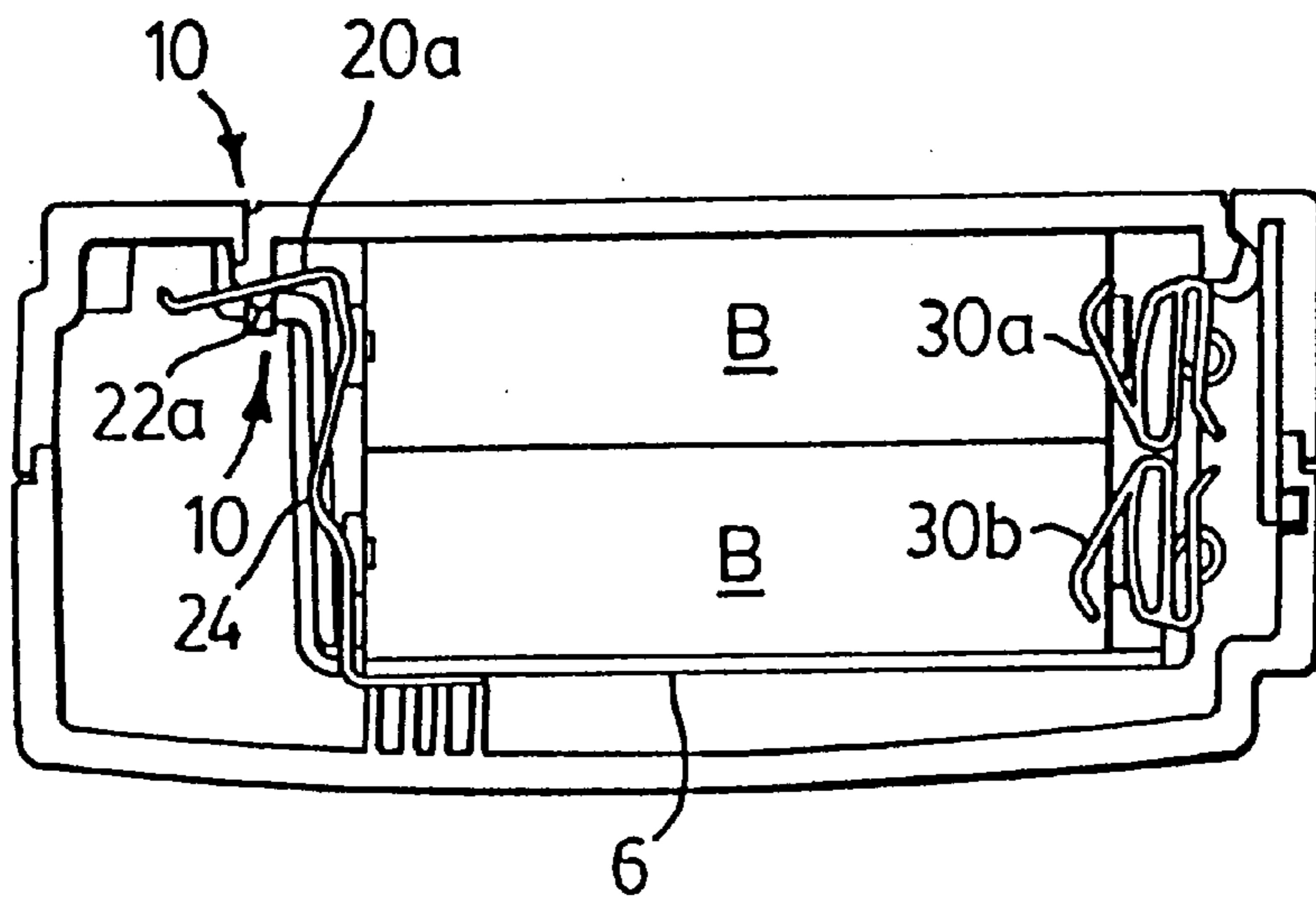


FIG. 2c

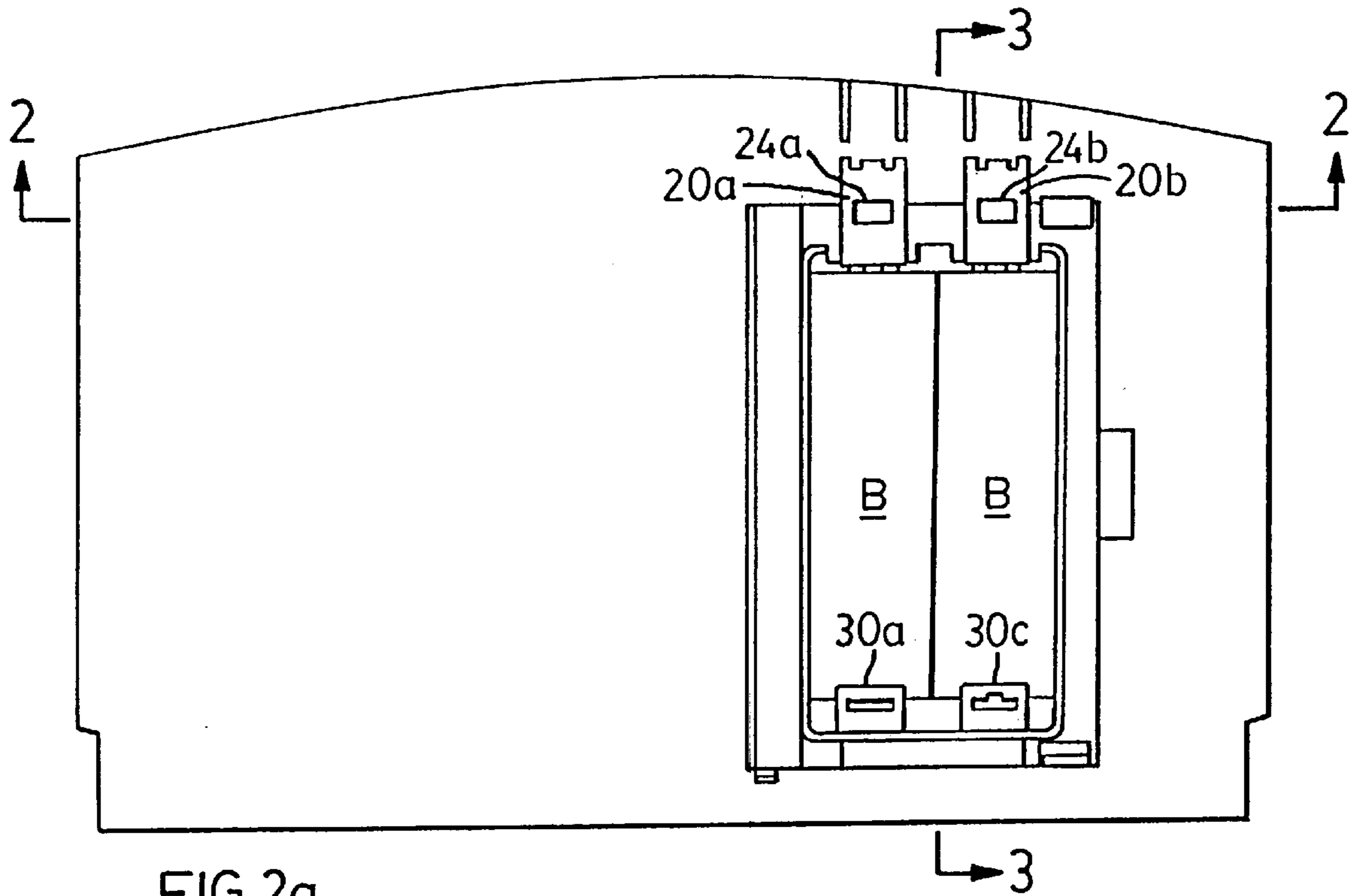


FIG. 2a

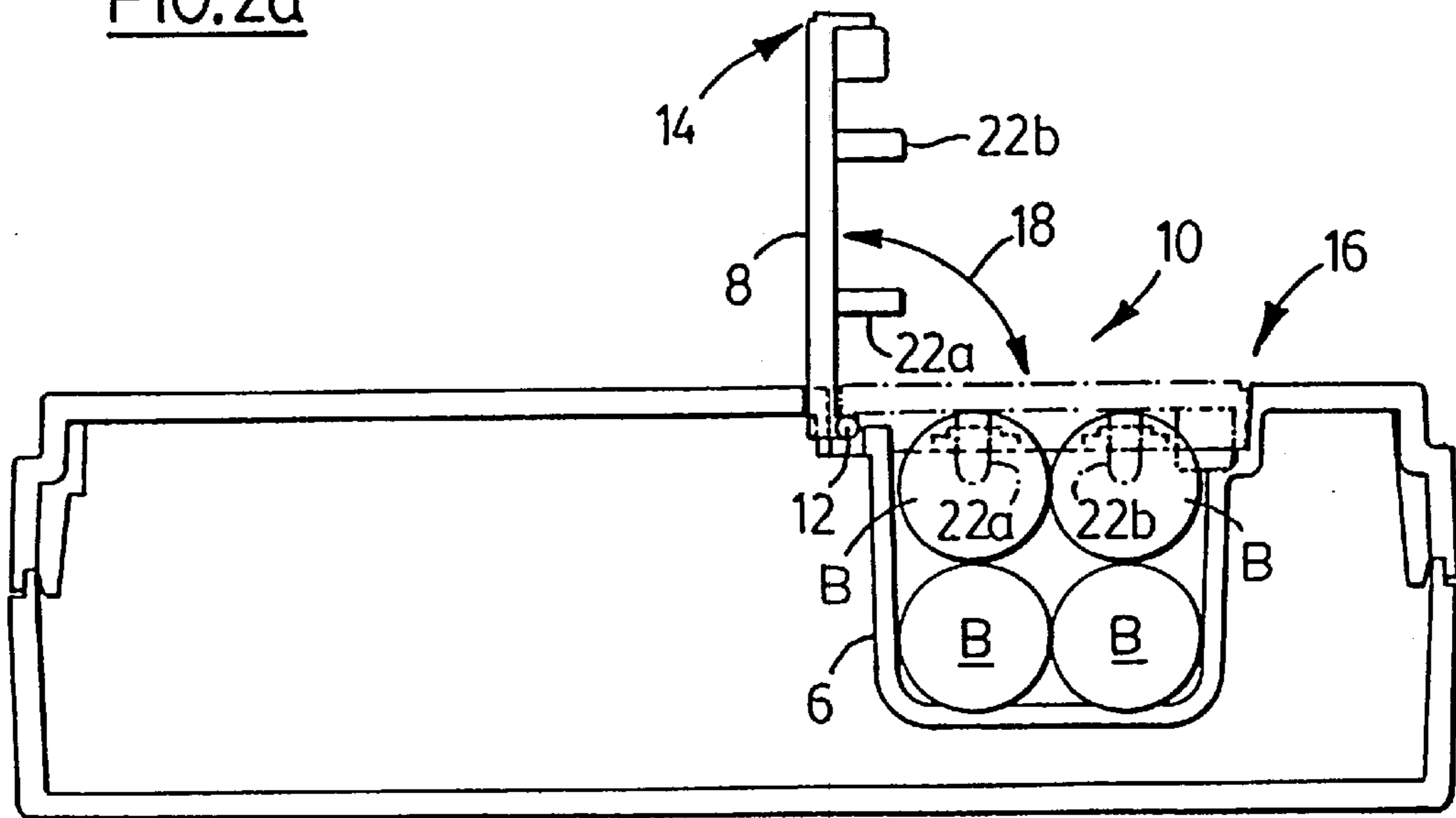
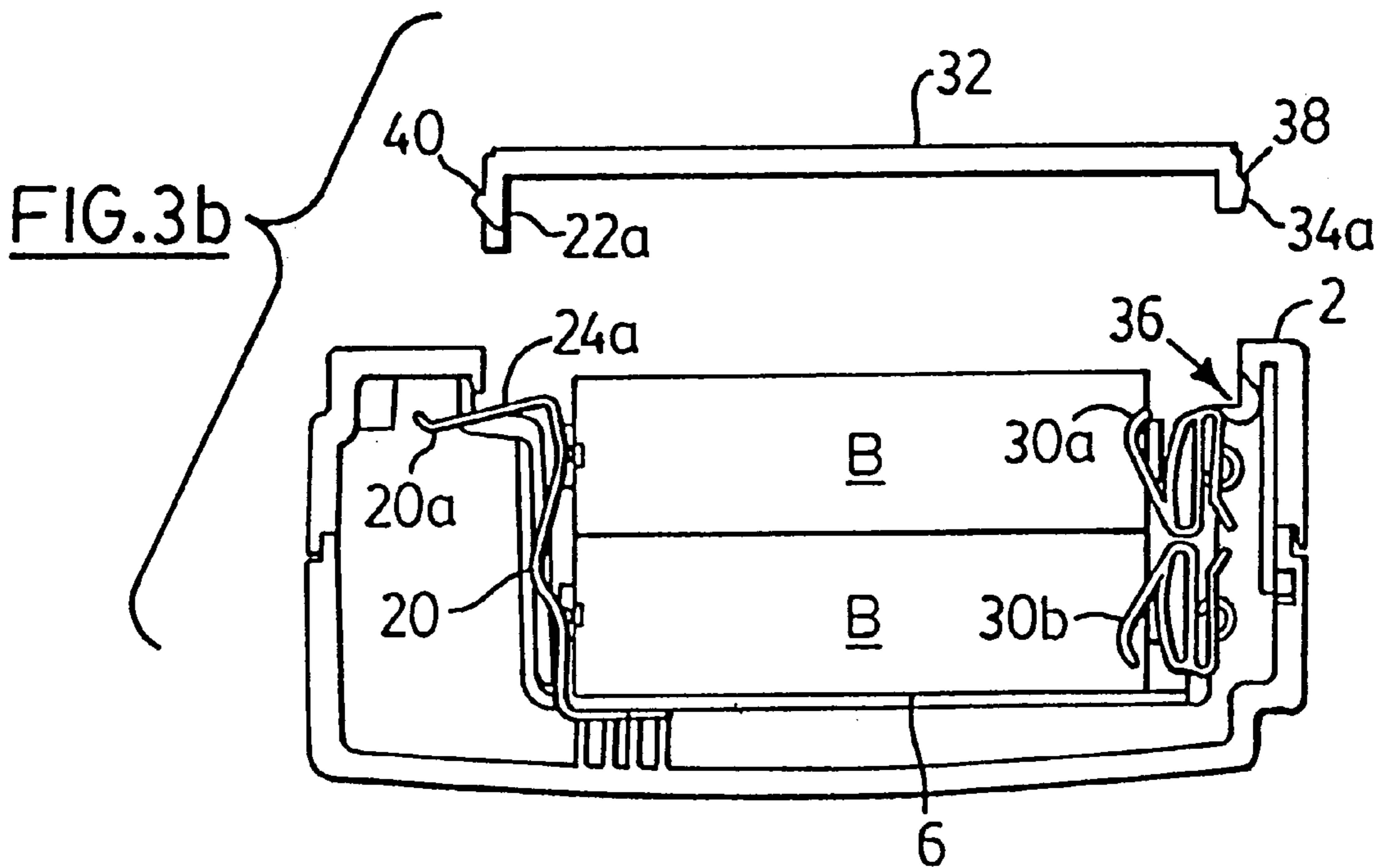
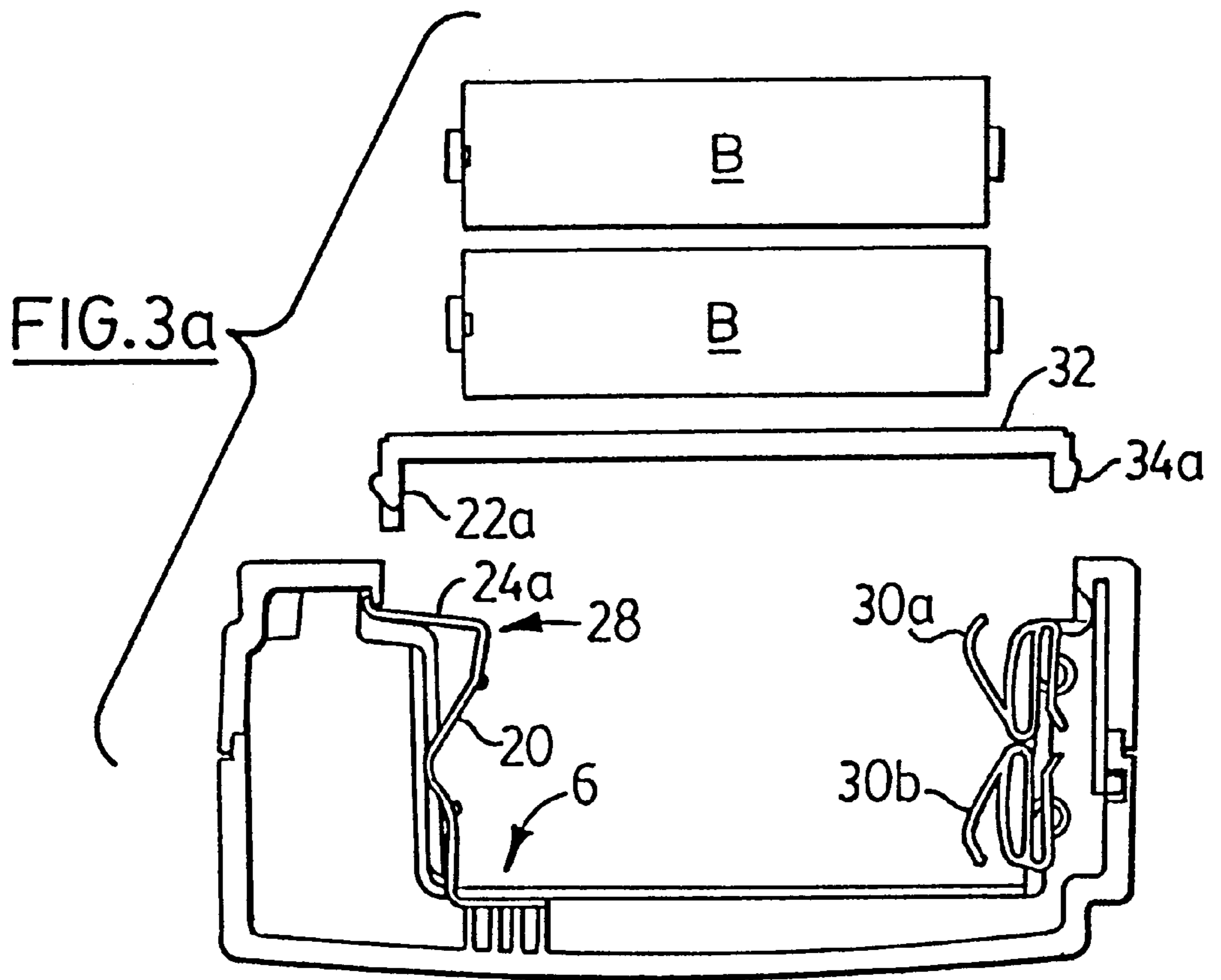


FIG. 2b



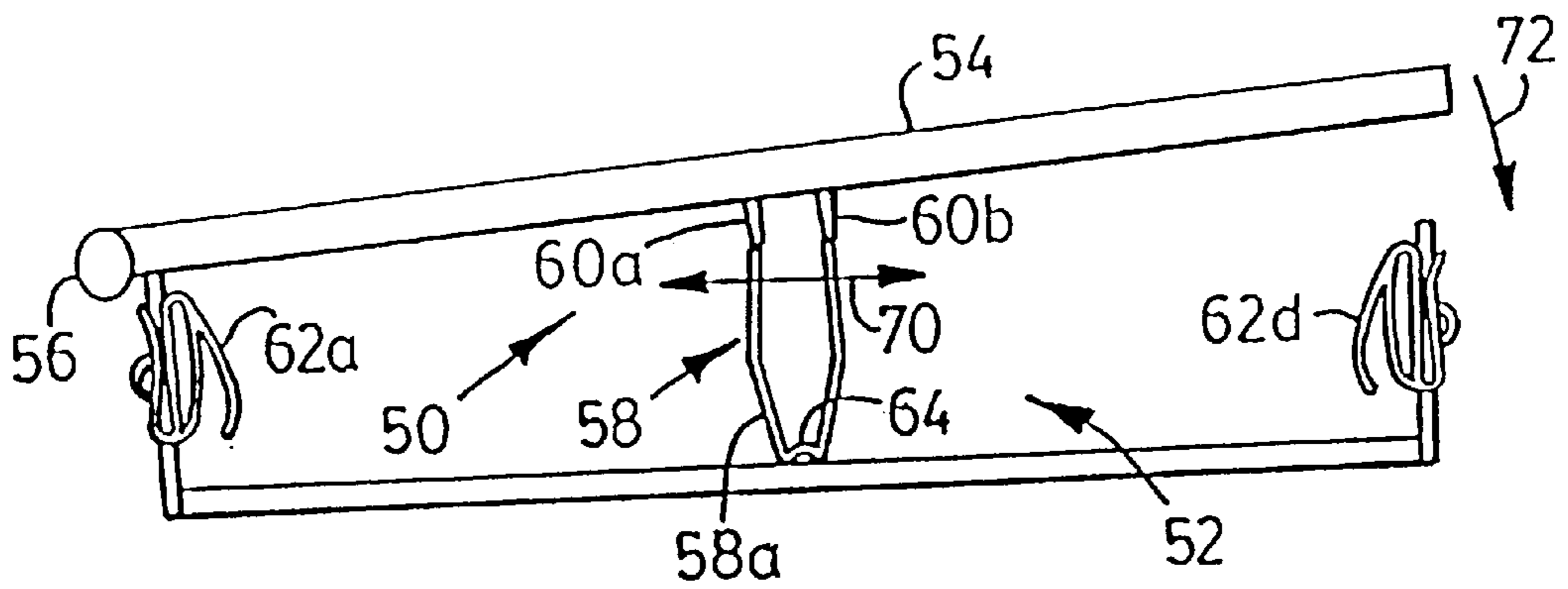


FIG. 4a

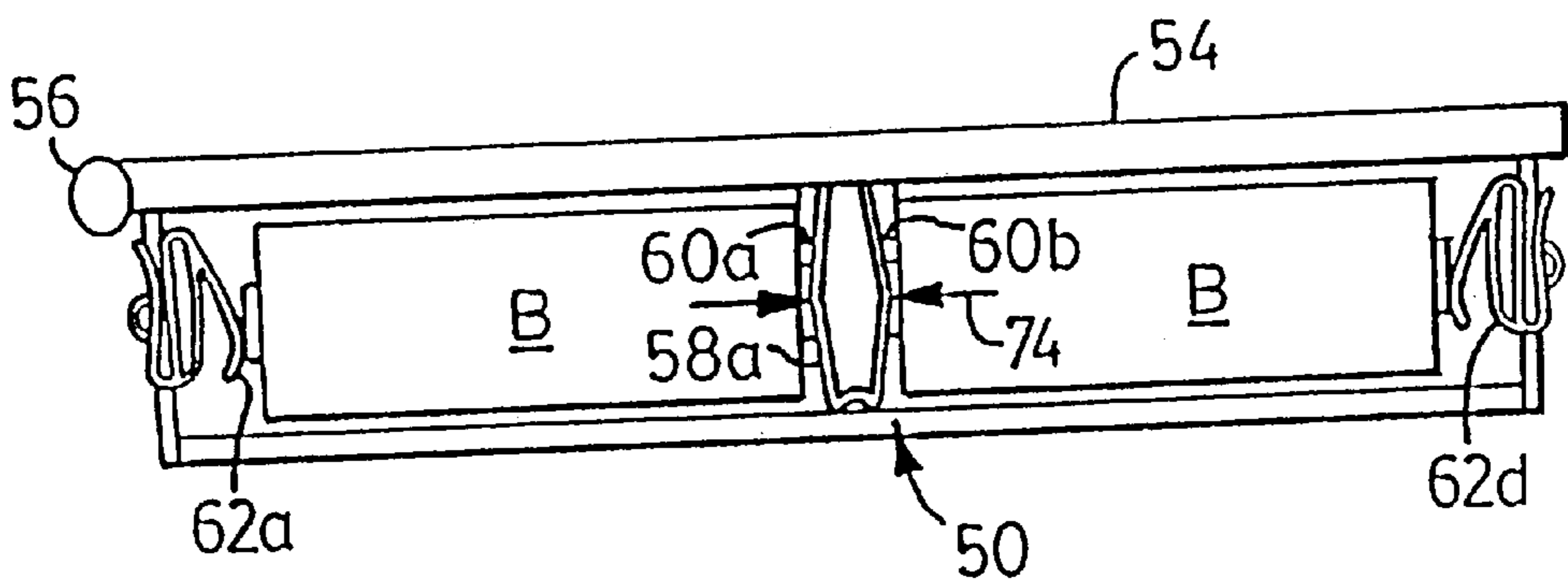


FIG. 4b

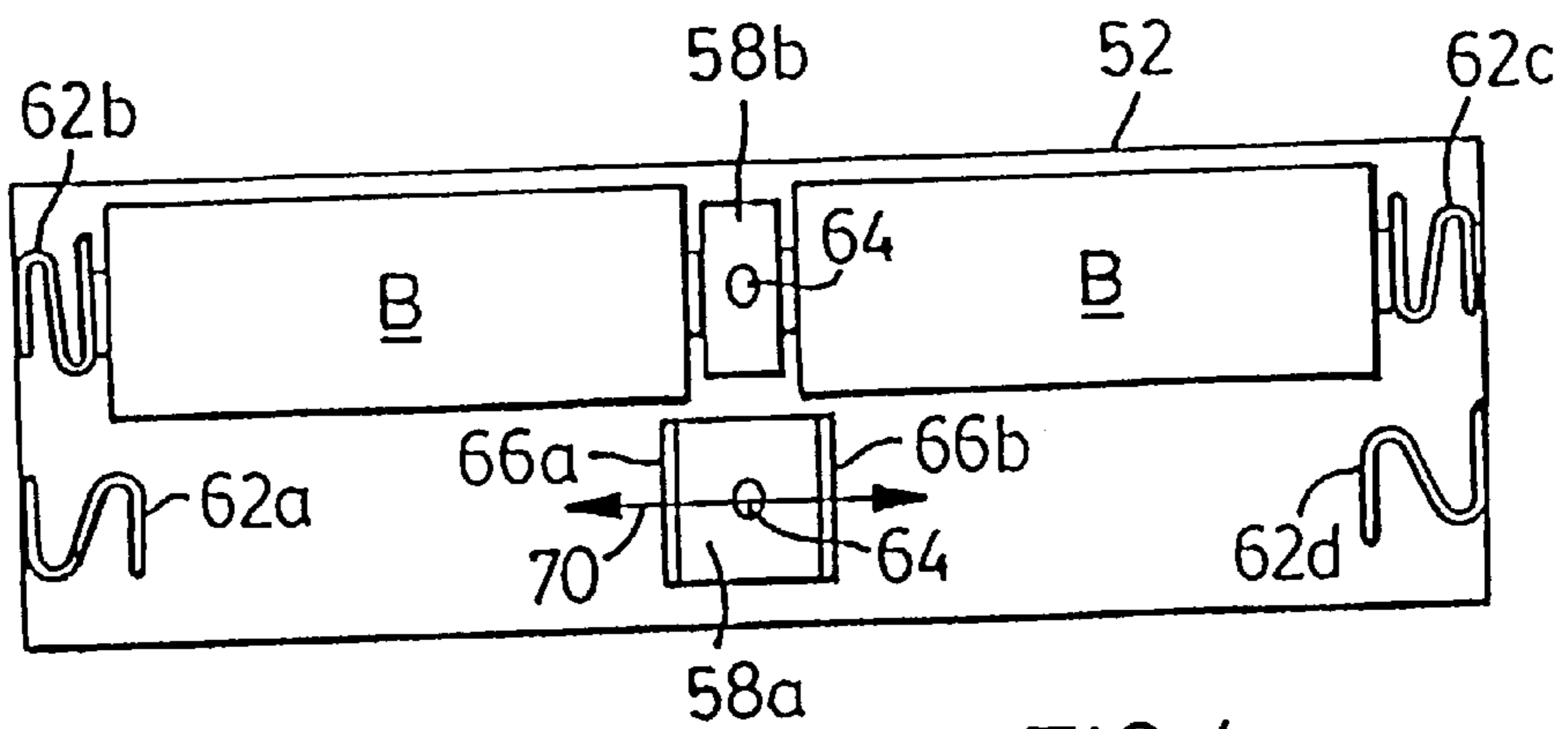


FIG. 4c

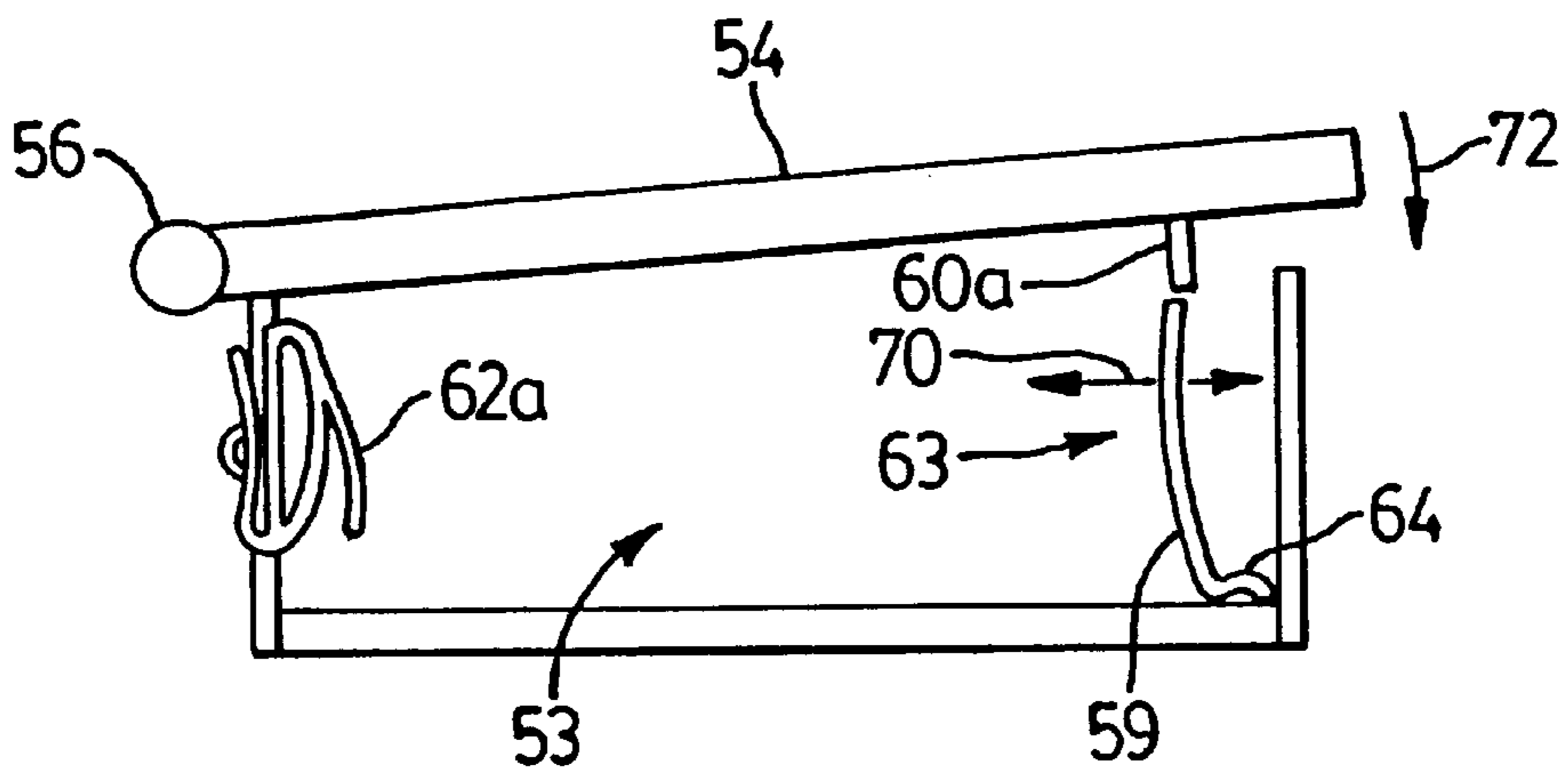


FIG. 5a

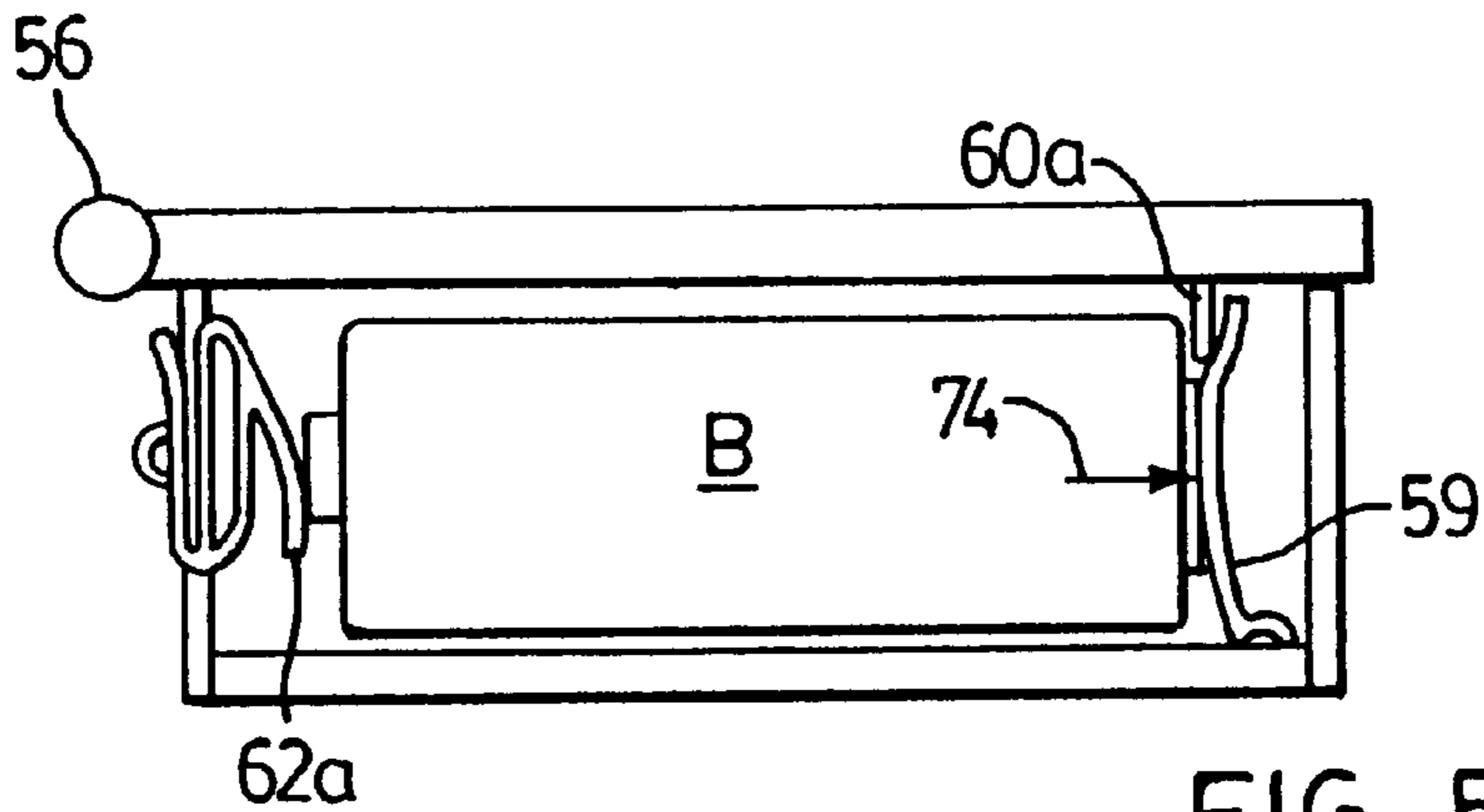


FIG. 5b

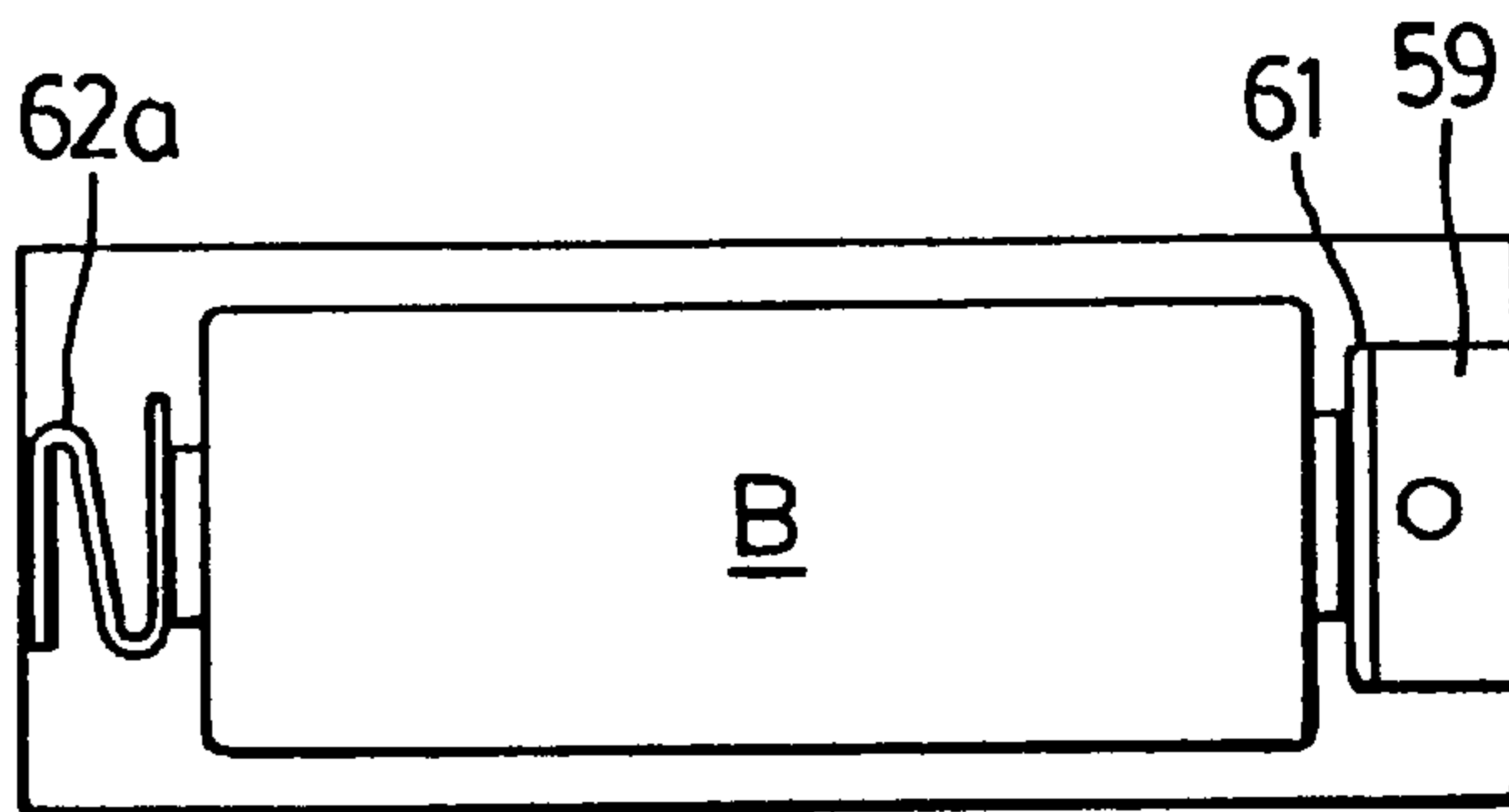


FIG. 5c

TERMINAL AND DOOR LATCH FOR BATTERY OPERATED DEVICES

This is a divisional patent application of U.S. patent application Ser. No. 08/688,140 filed Jul. 29, 1996, U.S. Pat. No. 5,820,406.

FIELD OF THE INVENTION

The present invention relates to battery-powered devices such as carbon monoxide detectors, smoke detectors and the like, and more particularly to a battery terminal and door latch mechanism for such devices.

BACKGROUND OF THE INVENTION

The advent of smoke detectors has led to the saving of countless lives each year. The effectiveness and decreasing costs of smoke detectors has resulted in their widespread use. More recently, carbon monoxide detectors have found growing appeal and use in both residential and commercial applications. Carbon monoxide detectors include an active element which is sensitive to carbon monoxide, and like smoke detectors, a loud alarm is activated upon detection of dangerous levels of carbon monoxide.

The trend has been to make smoke and carbon monoxide detectors battery-powered. While there are known line-powered devices, battery-powered devices have the advantage of not being susceptible to electrical supply brown-outs or outages.

The principal drawback with battery-powered detectors is the need to ensure that the batteries have been loaded and that the batteries are sufficiently charged to power the detector.

When a smoke detector is accidentally activated, for example from food burning on a stove element, there is a tendency to quickly silence the smoke detector by pulling out the batteries. While such an action is effective to deactivate the detector, there is always the risk that the batteries will not be replaced immediately, and as a result the smoke detector will remain in an inactive state.

More recently, certain regulatory bodies, for example Underwriters Laboratories (UL) in the United States, are requiring that some warning be given when batteries are missing from some types of safety devices such as smoke detectors.

Accordingly, there is a need in the art for a device which can be applied to carbon monoxide, smoke detectors and the like, which provides a visible indication that batteries have not been installed in the detector and which also can prevent the detector from being mounted in position without batteries installed.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a battery terminal and door latch arrangement particularly suited for application to smoke detectors, carbon monoxide detectors and the like. The battery terminal and door latch arrangement advantageously provide a visual indication that batteries have not been loaded in the detector and that therefore the detector is inoperable. In another aspect, the present invention prevents the detector from being mounted in position, e.g. on a wall bracket or ceiling bracket, if all the batteries are not installed.

A feature of the present invention is the arrangement of the battery terminals and the door latch assembly to provide a visual warning that batteries are missing from the detector.

The arrangement has the advantage of providing the warning without unduly adding parts or complexity to the detector.

In a first aspect, the present invention provides an apparatus for preventing closure of a battery compartment cover in a battery compartment for a battery powered device when the device is missing one or more batteries, said apparatus comprising: (a) latch means for latching said battery compartment cover in a closed position; (b) terminal means for contacting a terminal of said battery and providing an electrical connection; and (c) said terminal means including engaging means for engaging said latch means and said engaging means being operative to engage said latch means when a battery is mounted in said battery compartment, so that the battery compartment cover is latched in said closed position.

In a second aspect, the present invention provides in combination with a battery-powered safety detector, an apparatus for preventing closure of a cover door and providing an indication when one or more batteries are missing from a battery compartment in the safety detector, said apparatus comprising: (a) latch means for latching said cover door in a closed position; (b) terminal means for contacting a terminal of said battery and providing an electrical connection; and (c) said terminal means including engaging means for engaging said latch means and said engaging means being operative to engage said latch means when a battery is mounted in said battery compartment, so that the cover door is latched in said closed position indicates installation of said batteries.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will now be made to the accompanying drawings which show, by way of example, a preferred embodiment of the present invention, and in which:

FIG. 1 is a perspective view of a detector of the type suitable for a battery terminal and door latch arrangement according to the present invention;

FIG. 2(a) is a top view of the detector housing showing the battery terminal and door latch mechanism;

FIG. 2(b) is a section view of the detector housing of FIG. 2(a) taken through line 2—2;

FIG. 2(c) is a sectional view of the detector housing of FIG. 2(a) taken through line 3—3;

FIG. 3(a) is a sectional view of a detector housing incorporating a second embodiment of a battery terminal and door latch arrangement according to the present invention;

FIG. 3(b) is another view of the arrangement of FIG. 3(a) with batteries installed in the device;

FIG. 4(a) is a sectional view of another embodiment of a battery terminal and door latch arrangement according to the present invention; and

FIGS. 4(b) and 4(c) are alternate views of the battery terminal and door latch arrangement of FIG. 4(a) with batteries in place (FIG. 4(b)) and batteries missing (FIG. 4(c)).

FIG. 5(a)—5(c) show in diagrammatic form a single battery compartment implementation for the battery terminal and door latch compartment arrangement of FIGS. 4(a)—4(c).

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is first made to FIG. 1 which shows a detector 1 of the type suitable for utilizing a battery terminal and door

latch assembly according to the present invention. The detector 1 comprises a housing 2 which contains an active sensing element and associated electronic circuitry denoted generally by 4.

The detector 1 of interest is of the battery-powered type, and accordingly the detector 1 includes a battery compartment 6 for receiving batteries B. The battery compartment 6 is accessed through a cover door 8. The cover door 8 is secured by a door latch and battery assembly according to the present invention.

In the figures, like elements and components have like references.

As will now be described with reference to FIGS. 2-4, a battery terminal and door latch arrangement 10 according to the present invention prevents the cover door 8 from being closed unless the required number of batteries B are installed in the detector 1. The open (or missing) cover door 8 provides a visual indication that the detector 1 is missing batteries B and is therefore inoperative.

Referring to FIG. 2(b), the cover door 8 is connected to the housing 2 by a hinge/pin 12 of known design. The cover door 8 swings between an open position 14 and a closed position 16 as indicated by arrow 18. When batteries B are installed in the compartment 6, the cover door 8 snaps into the closed position 16 shown in dashed outline.

The battery terminal and door latch arrangement 10 according to the present invention comprises one or more spring contacts 20, shown individually as 20a, 20b in FIG. 2(a), and one or more latch protrusions 22, shown individually as 22a, 22b in FIG. 2(b) and fixed (or formed) on the bottom of the cover door 8. The spring contacts 20a, 20b have respective apertures 24a, 24b which are dispensed to communicate with the respective latch protrusions 22a, 22b when the batteries B are installed in the battery compartment 6. The spring contacts 20 are formed from a suitable electrical conductive material, e.g. metal strip or sheet, with a bend 26. When there are no batteries B installed, the bend 26 in the contacts 20 presses against the wall of the battery compartment 6 and biases the apertures 24 to a position 28 (FIG. 3a) in which the apertures 24 do not register with the latch protrusions 22. This prevents the cover door 8 from being closed when the batteries B have not been installed and the open cover door 8 provides a visual indication that batteries are missing from the detector 1. As shown in FIG. 2(c), the spring contacts 20 cooperate with terminal contacts 30 (shown individually as 30a, 30b and 30c in the figures) to complete the electrical (e.g. series) connection for the batteries B.

Referring to FIGS. 3(a) and 3(b), the hinged cover door 8 is replaced by a cover door 32 which snaps into the back of the housing 2 to cover the battery compartment 6. When the batteries B are installed as shown in FIG. 3(b) the spring contacts 20 are deflected, latch protrusions 22 on the cover door 32 register with the respective apertures 24 and latch protrusions 34 (which replace the hinge 12) register with respective locking slots 36 formed in the housing 2, and the cover door 32 is latched into a closed position. Preferably, the latch protrusion 34 (shown individually as 34a in FIGS. 3(a) and 3(b) includes a flange edge 38 for engaging the slot 36. Similarly, the latch protrusion 22 preferably includes a bevelled flange edge 40 for engaging the aperture 24. The bevelled flange edge 40 facilitates disengaging the latch 22 from the aperture 24 for removing the cover door 32 to access the battery compartment 6.

Reference is next made to FIGS. 4(a) to 4(c) which show another embodiment of a battery terminal and door latch

arrangement 50 according to the present invention. In this arrangement, the batteries B are mounted horizontally and end-to-end in a battery compartment 52. The battery compartment 52 is closed by a cover door 54 which is conventionally connected at hinge/pin 56. The latch arrangement 50 comprises spring contacts 58, shown individually as 58a and 58b, and latch protrusions 60, shown individually as 60a, 60b. Battery terminal contacts 62, shown individually as 62a, 62b, 62c and 62d are also provided in the battery compartment 52 in order to complete the electrical (i.e. series) connection of the batteries B.

Referring to FIG. 4(a), the spring contacts 58 are mounted in the centre of the battery compartment 52 using a suitable fastener 64, for example, a grommet. The spring contacts 58 are formed from a suitable electrically conductive metal strip or sheet and have a generally "U-shape" with prong ends 66, shown individually as 66a and 66b for the contact 58a (FIG. 4(c)). The spring contacts 58 are formed with a bend 68 which biases the prong ends 66 outwardly (as indicated by arrow 70) when one or more batteries are not installed in the compartment 52. The outward displacement of the ends 66a, 66b brings them into contact with the latch protrusions 60a, 60b when the cover 54 is moved to closed position 72 and prevents the cover 54 from being closed. The open cover door 52, in turn, indicates that batteries B are not installed, and in the case of devices 1 which are held in a wall or ceiling bracket the open door prevents the device 2 from being mounted in the bracket.

Referring next to FIG. 4(b), when batteries B are installed in the compartment 52, the spring contacts 58 are compressed and the prong terminals 66a are displaced inwardly (as indicated by arrow 74). The compression of the spring contact 58 should be sufficient to bring the prong ends 66 within the latch protrusions 60 as shown in FIG. 4(b) thereby allowing the cover door 54 to be closed.

Referring to FIG. 4(c), it will be appreciated that only one missing battery B prevents the cover door 54 from being closed. Similarly for the embodiments shown in FIGS. 2 and 3, a missing battery prevents the door 8 (32 in FIG. 3) from being secured in the closed position. It will also be appreciated that the battery terminal and door latch arrangement is suitable with slight modification for devices powered by a single battery, for example, a 9-Volt battery as will be described below with reference to FIGS. 5(a)-(c).

Reference is next made to FIGS. 5(a)-5(c), which show the battery terminal and door latch arrangement 50 of FIGS. 4(a)-4(c) for a single battery compartment 53. In FIGS. 4(a)-4(c) and FIGS. 5(a)-5(c), like reference numerals indicate like elements. Referring to FIGS. 5(a)-5(c), the battery terminal and door latch 50 includes a single spring contact 59 which is mounted in the battery compartment 53. The spring contact 59 is formed from a suitable electrically conductive metal strip or sheet and like the contacts 58 (FIG. 4) includes a prong end 61. The spring contact 59 also includes a bend 63 which biases the prong end 61 outwardly (as indicated by arrow 70) when a battery is not installed in the compartment 53. The outward displacement of the prong end 61 brings it into contact with the latch protrusion 60a when the cover is moved to closed position 72 and prevents the cover 54 from being closed. The open cover door 54, in turn, indicates that the battery is not installed, and in the case of devices 1 which are held in a wall or ceiling bracket, the open door prevents the device from being mounted in the bracket.

Referring next to FIGS. 5(b) and 5(c), when the battery B is installed in the compartment 53, the spring contact 59 is

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compressed and the prong end **61** is displaced inwardly (as indicated by arrow **74**). The compression of the spring contact **59** should be sufficient to bring the prong end **61** within the latch protrusion **60a** as shown in FIG. **5(b)** thereby allowing the cover door **54** to be closed.

Summarizing, the present invention provides an effective mechanism for preventing the closure of the battery compartment door in a smoke detector, carbon monoxide detector or the like, when there are no batteries installed or a battery is missing. This in turn provides a readily discernible indication that the detector is without batteries and therefore inoperable. The arrangement has the additional advantage of being simple and inexpensive to manufacture and does not add parts or substantially increase the complexity of detectors.

The present invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. Therefore, the presently discussed embodiments are considered to be illustrative and not restrictive. The scope of the invention being indicated by the appended claims rather than the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed is:

1. An apparatus for preventing closure of a battery compartment cover in a battery compartment for a battery-powered device when a battery is missing from the battery compartment, said apparatus comprising:

- (a) latch means for latching said battery compartment cover in a closed position;
- (b) terminal means for contacting a terminal of the battery and providing an electrical connection; and
- (c) said terminal means including engaging means for engaging said latch means and said engaging means

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being operative to engage said latch means when the battery is mounted in said battery compartment, so that said battery compartment is latched in said closed position, wherein said engaging means comprises a battery terminal having a flexible prong end, said battery terminal having means responsive to insertion of the battery for displacing said prong end from a latch blocking position to a latch engaging position so that said battery compartment cover is movable to said closed position.

2. In combination with a battery-powered safety detector, an apparatus for preventing closure of a cover door and providing an indication when a battery is missing from a battery compartment in the safety detector, said apparatus comprising:

- (a) latch means for latching said cover door in a closed position;
- (b) terminal means for contacting a terminal of the battery and providing an electrical connection; and
- (c) said terminal means including engaging means for engaging said latch means and said engaging means being operative to engage said latch means when the battery is mounted in said battery compartment, so that the cover door latched in said closed position indicates installation of the battery, wherein said engaging means comprises a terminal having a deflectable prong end, said deflectable prong end being deflected in response to insertion of the battery to a position for engaging said latch means so that said cover door is secured in said closed position.

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